

## Structure Design of Plate Spring Immersion Lacquer

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### Abstract

This paper design a leaf-spring varnished, able to complete loading, varnished and drying process, the reference line design thought, main features can be divided into three parts including: institutions, varnished pool, complete drying box. The innovative design of a steel rope conveyor chain and sprocket wheel can satisfy the large Angle deflection of the transmission chain to complete the process of the coating process. To calculate and check the size of the institutions (including the calculation of the motor power, the design of the shaft, sprocket parameter calculation, etc.) in the end, the calculation results for modeling and simulation. This research focuses on developing the production line of the plate spring and realizing the automation of the spring production. In order to accelerate the cycle time of the spring production, the quality of the plate spring is improved. This production line will greatly improve the efficiency of plate spring production, and greatly improve the economic performance of enterprises.

### Keywords

Suspension conveyor chain, the conveyance mechanism of the workpiece, Large Angle deflection.

### 1. Introduction

Leaf spring is one of the important products of the vehicle industry. It is simple in structure and convenient in manufacture and maintenance. Besides as an elastic element, it also plays the role of transmitting lateral and longitudinal forces and moments. It is supported by two points on the frame or body, and the force is reasonable, and the characteristics of variable stiffness can be applied widely. The leaf spring is one of the main components of a car. It connects the frame and the axle elastically. Its main function is to transfer the force and torque between the wheel and frame, and to ease the impact load from the uneven pavement to the frame to attenuate the vibration of the bearing system caused by the impact load, so as to ensure the smooth driving of the car. Therefore, the performance of the auto leaf spring directly affects the safety and quality of the vehicle, which is related to the smoothness, comfort and operating stability of the vehicle, and the quality of the plate spring products has been paid more and more attention.

### 2. Composition of Dipping Device

The dipping device can be divided into three parts, namely, execution system, drive system and support system. It can hang objects in space and do dipping and drying. (1) The executive system: As in Figure 1. It is a mechanism used for dipping and painting devices to suspend and transmit workpieces. The hanger is mounted on the lower part of the slide rail to suspend the workpiece leaf springs, and the hangers rely on the steel rope to transmit power. (2) Drive system: To provide power for the whole pipeline, consisting of an asynchronous motor, reducer, bevel gear and transmission shaft. (3) Support system: As in Figure 2. It is the basic part of the dipping device and plays a supporting role for the whole production line. Because the automatic dipping device[1] studied is an assembly line dipping device, the fixed chassis is selected. It directly supports the conveying parts of workpieces so as to realize flow production.

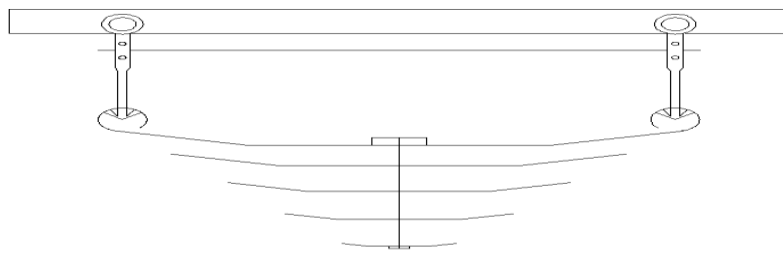


Fig 1. Suspension mode

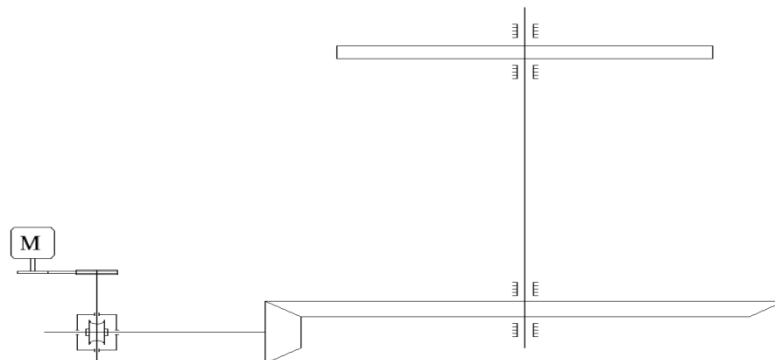


Fig 2. Transmission principle

### 3. The Design of V Pulley Design Requirements

The design of V pulley design requirements are: small quality, good structure process, no large internal stress of casting, uniform quality distribution, power machine Y series three-phase asynchronous motor[2]. Power  $P=20.71\text{kw}$ ,  $n_1=1440\text{r/min}$ . Speed reducer input shaft speed  $n_2=630\text{r/min}$ . Work 16h or more per day, and hope that the center distance should not exceed 700mm. The size of the V band can be obtained by calculation as shown in Figure 3.

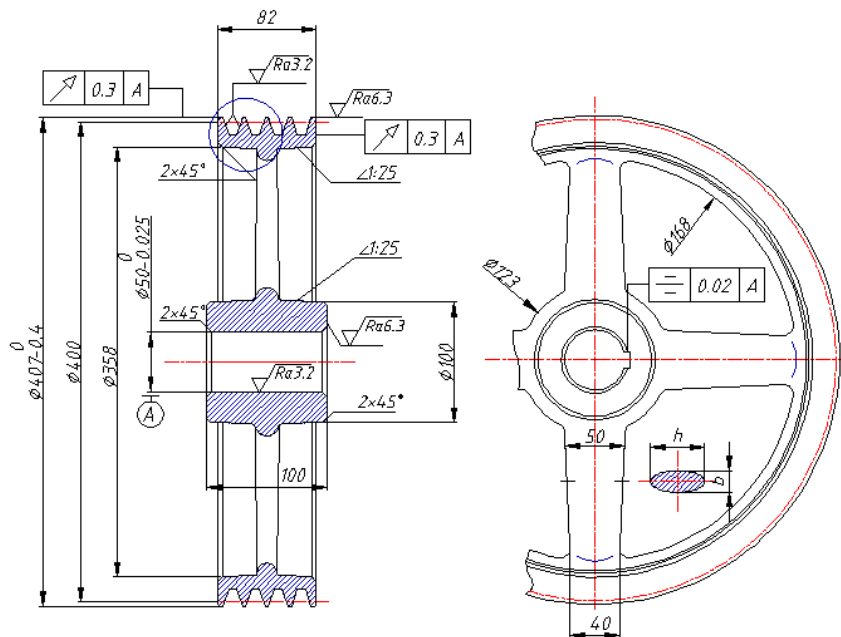


Fig 3. The V pulley size

### 4. Selection of Worm Reducer

In the calculation of the last part of the V band, the speed of the belt wheel is 630r/min, the drive ratio of the bevel gear is  $i=1.67$ , the speed of the speed of the big bevel gear is  $V_2$ [3] equal to the chain

speed of the production line is 0.5m/min, the line speed of the small bevel gear is 8.35m/min, the diameter of the small bevel gear is 360mm, and the speed of the small bevel gear can be calculated to be 25r/min. The deceleration ratio is 25. Because of the limited space provided by the frame, the RV30 type worm reducer can be selected in combination with the deceleration ratio. Its advantages are: compact mechanical structure, compact size, small and high efficiency, good heat exchange performance, fast heat dissipation, easy installation, flexible and agile, superior performance, easy maintenance and maintenance, smooth operation and low noise. It is durable, practical and reliable. The combination of the above data can get the reducer model RV3025FBDZ[4].The size of the worm shaft is shown in Figure 4.

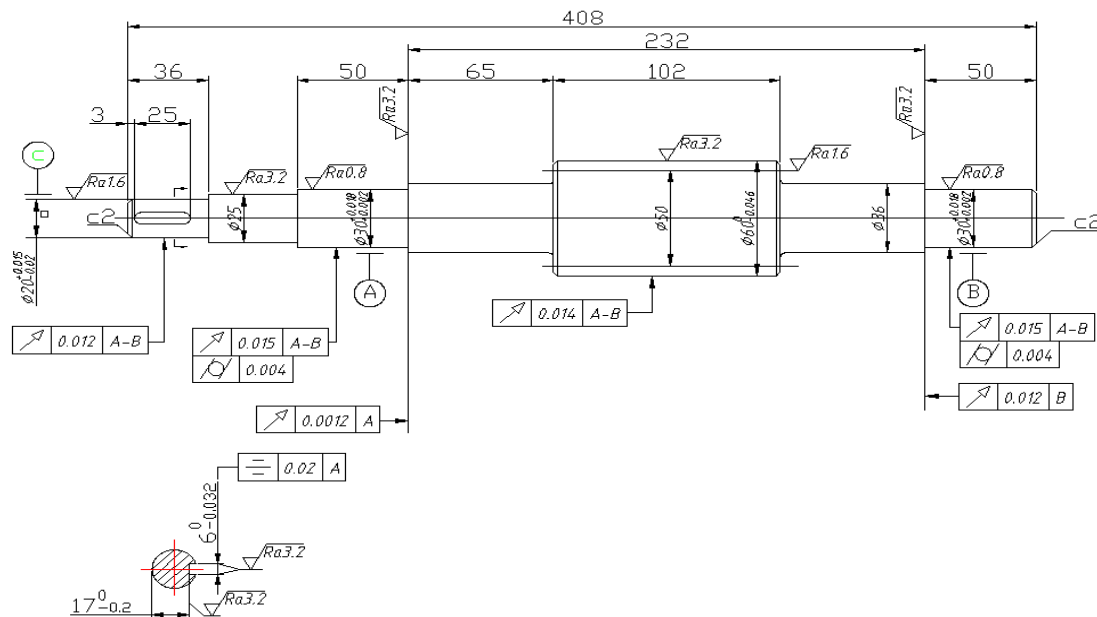


Fig 4. The worm axis size diagram

## 5. Analysis and Discussion of the Results

In the design of the whole device, through the design and assembly of the power mechanism and the auxiliary mechanism, we have completed all the processes from the pendant, the lacquer, the drying and the finished products. In the drying process, we choose the vertical blower drying box, while the drying box surrounds nearly half the length of the production line, drying at different levels and multi temperature, effectively ensuring the quality of the coating. For the design of the auxiliary mechanism, we adopt the bracing frame of the I-steel, which effectively ensures the balance of the force of the immersion lacquer and the drying device, so that the whole process of the lacquer is carried out smoothly.

## References

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